Molecular Biology

A MATHEMATICAL MODEL OF CAPSULE BIOSYNTHESIS IN *ESCHERICHIA COLI*

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The capsule biosynthesis pathway in *Eschericia coli* is of both scientific and medical importance because it may be responsible for many antibiotic resistant infections due to biofilm formation. However, it is often difficult to experimentally demonstrate the mechanisms of the regulation of this system, so a mathematical model of the system was developed which can be compared to experimental data obtained in the laboratory. Using the Law of Mass Action, which allows one to compose a set of equations to describe a particular biochemical system, one hundred twenty-seven equations were developed which, when modeled on a computer, give some idea of the ways in which the expression of the capsule biosynthesis operon in *E. coli* is affected by several regulatory molecules in the pathway. The output from these equations is currently being compared to experimental data already collected on the system in order to mimic the mechanisms of capsule biosynthesis. Also, several experiments are underway in order to calibrate the rate constants and several of the variables from the model. Once the model has been refined to include the experimental data, it is expected that it might provide valuable information about lesser understood areas of the pathway. Also, the model may provide the basis for new experimentation on the capsule biosynthesis pathway. Mathematical models allow scientists to see their research from a new point of view, which can be extremely valuable in proving and disproving various hypotheses concerning biochemical pathways. These equations are expected to be the starting ground for the elucidation of several unanswered questions about capsule synthesis in *E. coli*, making cures for antibiotic resistant infections more readily attainable.